PLANT PHENOTYPING RESEARCH CENTER

The mission of the **PSI Plant Phenotyping Research Center** (PPRC) is to provide state-of-art infrastructure for plant cultivation and automated high-throughput phenotyping of wide range of plant traits.
We offer access to cutting edge instruments and provide professional support of highly skilled technical and scientific personnel. **PPRC** infrastructure is available for use by visiting scientists and on fee-for-service basis for a wide range of phenotyping experiments.

PPRC operates high-end **walk-in growth chambers** for precise growth of plants and **PlantScreen™** platforms for automated phenotyping of **small and mid-size plants in controlled environment** (e.g. turfgrass, *Arabidopsis thaliana*) and for **cultivation and monitoring of larger crop plants up to 1.5 meter** in height.

Large-scale walk in chambers for highly precise plant cultivation.

Automated phenotyping of up to 320 small- and mid-size scale plants in controlled environment in PlantScreen™ Compact System.

Automated phenotyping of 270 plants up to 1.5 in height in greenhouse environment in PlantScreen™ Modular System.

PPRC is situated in countryside next to Brno in **Czech Republic**, city where Johann Gregor Mendel lived and worked. For more information contact us at info@psi.cz.

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PLANTSCREEN™ AUTOMATED PHENOTYPING SYSTEMS

Screening tools for identification of traits contributing to salinity tolerance in *Arabidopsis*

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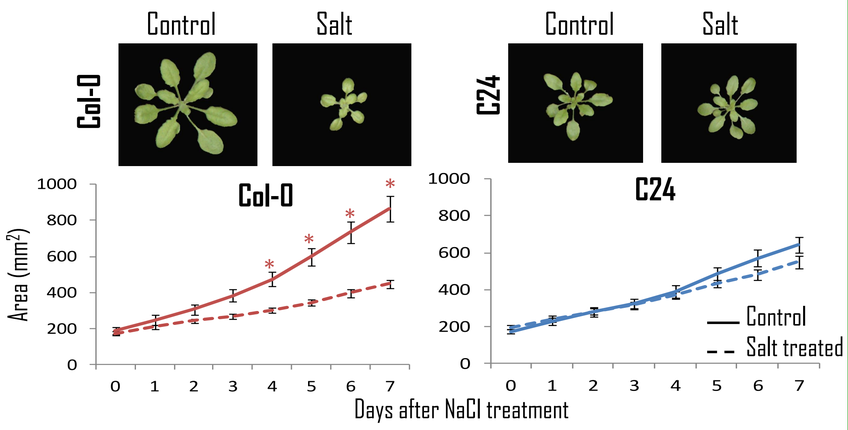
Rationale

Soil salinity is one of the main stress factors severely affecting the agriculture land in global scale and causing significant reduction of plant growth and yield. To enhance our understanding of the early responses to salinity, we designed an experimental protocol based on automated integrative analysis of photosynthetic performance, growth analysis and color index analysis at the onset and early phase of salinity stress response in *Arabidopsis thaliana* ecotypes grown in soil. Here we show that the developed experimental procedure allows to analyse dynamically structural and physiological phenotypes very early upon stress imposition. Results for two accessions Col-0 and C24 are shown. C24 was previously described for increased salt tolerance. Salinity significantly and rapidly affected photosynthetic performance and impacted growth dynamics of Arabidopsis plants at different stages of stress response.

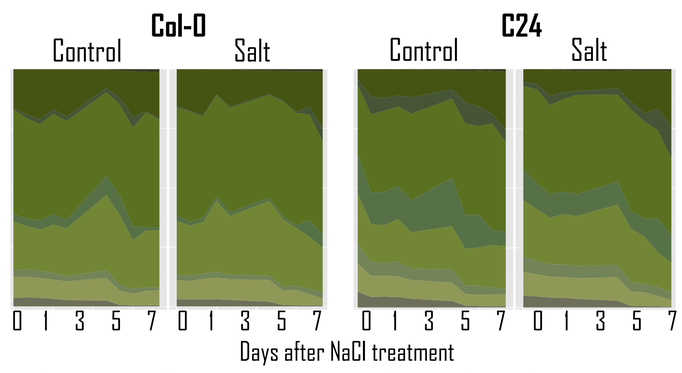
Results

Growth rate in salt treated plants was reduced early upos stress imposition with C24 showing increased salt tolerance



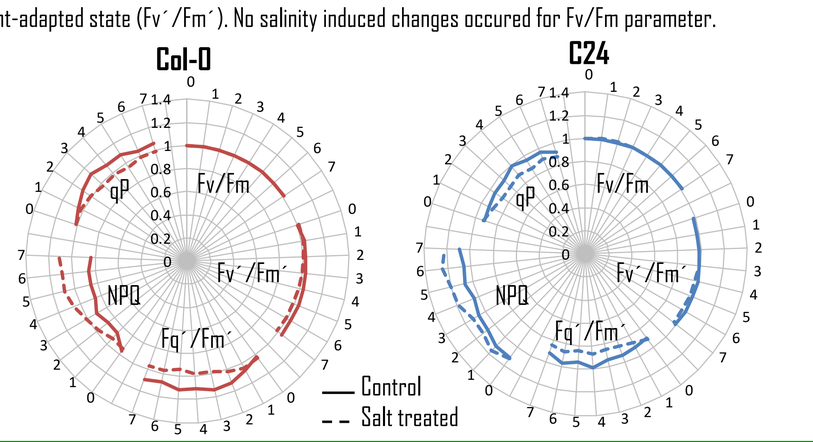
Relative changes in rosette color are affected by salt stress treatment .

100% stacked charts of 9 RGB color-coded greenness hues presented as changes in % area over time. The greenness hues summarize the [red:green:blue] channel values corresponding to the green hues identified through the color-segmentation process of RGB images.



Photosynthetic performance is rapidly reduced in salt treated plants .

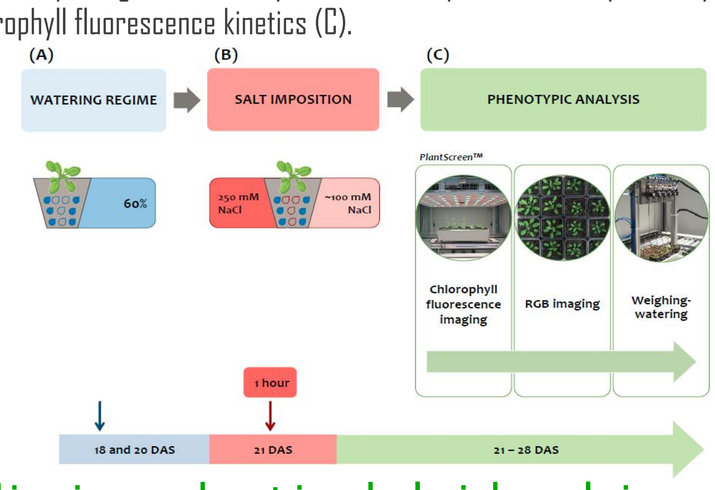
Salinity induced rapid changes in regulatory light-induced heat dissipation (NPQ), PSII operating efficiency (Fq´/Fm´), photochemical quenching (qP) and partially in maximum quantum yield in light-adapted state (Fv´/Fm´). No salinity induced changes occured for Fv/Fm parameter.



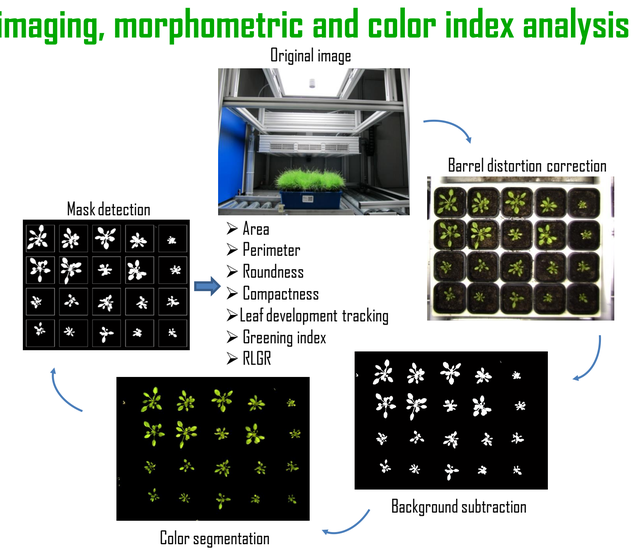
Materials and Methods

Phenotyping Protocol

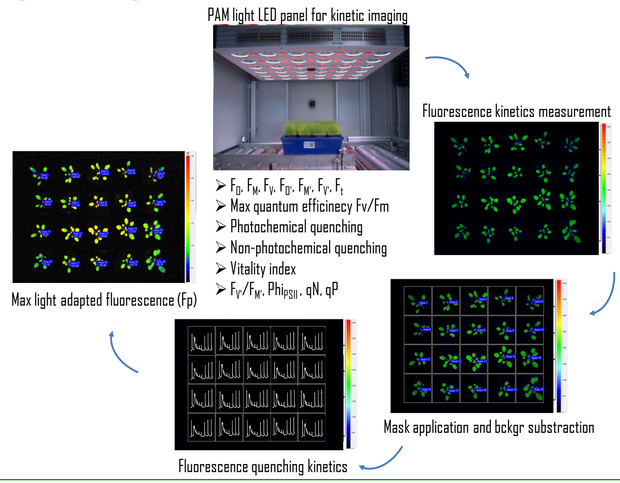
Arabidopsis thaliana Col-0 and C24 accessions were grown in 12h-12h light conditions under cool-white LED illumination of 150 µmol/m²/s in FS-WI Chamber (PSI). Before the salt imposition plants were automatically weighed and watered using PlantScreen™ Phenotyping System to adjust soil moisture to 60% of soil water capacity (A). At 21 days after stratification (DAS) plants were treated with 250 mM NaCl solution for one hour, ensuring saturation of the soil with the solution. The effective NaCl concentration in the soil after salt imposition corresponded to 100 mM NaCl (B). Plant responses to salinity stress were monitored for 7 days using PlantScreen™ System by image-based morphometric analysis and in-depth analysis of chlorophyll fluorescence kinetics (C).



RGB imaging, morphometric and color index analysis



Chlorophyll fluorescence kinetic imaging and analysis of photosynthetic performance



Acknowledgements

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Conclusions

- Integrative concept of PlantScreen™ high-throughput phenotyping platform provides a powerful tool for acquisition and selection of morphological and physiological parameters.
- Rapidly after stress initiation photosynthetic performance of the salt-treated plants was compromised, followed by growth retardation and changes in greenness.
- Presented method shows robust experimental set-up for salinity tolerance screening in Arabidopsis and other plant species.